REMARKS

Claims 1 – 48 are currently pending in the application. No claims are amended with the present response. Reconsideration of the rejected claims in view of the following remarks is respectfully requested.

Allowable Subject Matter

Applicant appreciates the Examiner's indication that claims 16 – 20[1] and 30 – 41 are allowed. However, Applicant respectfully submits that all of the claims are in condition for allowance for the reasons set forth below. Additionally, Applicant respectfully notes that the Examiner's statement on page 16 of the instant Office Action that all claims are rejected is inaccurate, as claims 16 – 20 are objected to and claims 30 – 41 are allowed.

Claim Interpretation

With regard to claim 15, the Examiner asserts that "wherein the evaluating step eliminates the need for a full simulation calculation each and every time new specified aberration values are provided and presented for calculation of a new image profile" is an intended use. The Examiner indicates that this limitation is generally not afforded any patentable weight where it merely recites the purpose of a process. Applicant respectfully disagrees.

Applicant submits that intended use applies to apparatus and article claims. That is, MPEP § 2114, which is titled "Apparatus and Article Claims - Functional Language," is

[1] Applicant respectfully notes that claims 16 – 20 are dependent claims, and thus are allowable claims and not allowed claims, as the Examiner states.

specifically directed to apparatus and article claims and is inapplicable to method claims.

Applicant has reproduced MPEP § 2114 below, which states (emphasis added):

> APPARATUS CLAIMS MUST BE STRUCTURALLY DISTINGUISHABLE FROM THE PRIOR ART
>
> >While features of an apparatus may be recited either structurally or functionally, claims< directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. >*In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).
>
> MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART
>
> A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (The preamble of claim 1 recited that the apparatus was "for mixing flowing developer material" and the body of the claim recited "means for mixing ..., said mixing means being stationary and completely submerged in the developer material". The claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer. However, the mixer was only partially submerged in the developer material. The Board held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected.).

In view of the above, Applicant submits that MPEP 2114 is explicit in that it applies to apparatus and article claims. As such, Applicant submits that the Examiner's assertion that the above-noted feature of method claim 15 can be construed as intended use is inaccurate, and the

Examiner's treatment of the above-noted feature of method claim 15 as intended use (and thus afforded little or no patentable weight) is *per se* improper.

35 U.S.C. §102 Rejection

Claims 1 – 6, 9 – 13, 15, 21 – 26 and 46 – 48 were rejected under 35 U.S.C. §102(e) for being anticipated by U.S. Patent No. 6,653,032 issued to Miwa et al. ("Miwa"). This rejection is respectfully traversed.

To anticipate a claim, each and every element as set forth in the claim must be found, either expressly or inherently described, in a single prior art reference. MPEP § 2131. Applicant respectfully submits that Miwa does disclose each of the features of the present invention.

Independent Claims 1, 46 and 47

The present invention relates to a method and system for reconstructing aberrated image profiles through simulation. Claim 1 recites, in pertinent part:

> . . . providing imaging configuration characteristic data;
> performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices;
> building response surface functional relations using the processor of the one or more computing devices between variables of lens characteristics and an image profile of interest using the simulation calculations; and
> evaluating specified aberration values of a lens in relation to the response surface functional relations using the processor of the one or more computing devices to provide an estimate of the image profile in a presence of specified aberration(s).

Claim 46 recites, in pertinent part:

> . . . means for performing simulation calculations for various levels for each aberration component using image configuration characteristic data;
>
> means for building response surface functional relations between variables of lens characteristics using the simulation calculations;
>
> means for evaluating specified aberration values of a lens in relation to the response surface functional relations to provide image profile estimates for the specified aberration values; and
>
> means for applying the aberrated image profile estimates in an optimization calculation method which judges image profile information against defined criteria as part of a lens adjustment optimization calculation.

Claim 47 recites, in pertinent part:

> . . . performing simulation calculations for various levels for each aberration component using image configuration characteristic data;
>
> building response surface functional relations between variables of lens characteristics using the simulation calculations; and
>
> evaluating specified aberration values of a lens in relation to the response surface functional relations to provide image profile estimates for the specified aberration values.

Applicant submits that Miwa does not disclose each of the features of the present invention. For example, Applicant submits that Miwa at least does not disclose: (1) performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices (claim 1); (2) means for performing simulation calculations for various levels for each aberration component using image configuration characteristic data (claim 46); and (3) performing simulation calculations for various levels for each aberration component using image configuration characteristic data (claim 47).

No Disclosure of Performing Simulation Calculations For Various Levels For Each Aberration Component Using Image Configuration Characteristic Data or Means Therefor

Miwa is directed to a method for lithographic processing of semiconductor devices and an exposure system for use in a process that has a means for calculating the margins of exposure energy and focus, as well as for calculating the optimum values of exposure energy and focus offset and a means for assigning an exposure device used for such processing, based on the calculated margins of exposure energy and focus. While acknowledging that Miwa notes that these parameters change depending on the aberration of the projection lenses of the exposure devices, Applicant submits that Miwa does not disclose performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices (or means therefor) as recited in claims 1, 47 and 48.

Instead, Applicant submits that Miwa merely discloses a first database storing aberration information of projection lenses of a plurality of exposure devices. This stored aberration data is used by Miwa to calculate the margins of exposure energy and focus, as well as for calculating the optimum values of exposure energy and focus offset, which is used to assign a particular exposure device used for such processing. More specifically, Miwa discloses at col. 3, line 61 – col. 4, lines 44 that (emphasis added):

> . . . a method for lithographic processing of semiconductor devices and an exposure system for use in that process that has a means for calculating the margins of exposure energy and focus, as well as for calculating the optimum values of exposure energy and focus offset, which change depending on the aberration of the projection lenses of the exposure devices; and a means for assigning an exposure device used for such processing, based on the calculated margins of exposure energy and focus.

> The present invention includes, in one embodiment, a first database storing aberration information (for example, Zernike coefficients) of projection lenses of a plurality of exposure devices; a second database storing process specification information such as illumination parameters (e.g., exposure wavelength, numerical aperture NA of lenses, illumination coherency σ); photoresist parameters (e.g., type, thickness and development time) and tolerance CD values for the exposure steps of the semiconductor device fabrication; a third database storing circuit pattern information used for the exposure steps of the semiconductor device fabrication; a fourth database storing dispatch rules of the exposure devices; a fifth database in which the margins of exposure energy and focus as well as the optimum values of exposure energy and focus offset for the steps on the plurality of exposure devices are registered; an exposure parameter calculation processing portion for calculating the margins of exposure energy and focus as well as the optimum values of exposure energy and focus offset; and an exposure device assignment processing portion for selecting an exposure device to be used for the exposure step based on the margins of exposure energy and focus of the plurality of exposure devices and the dispatch rules of the exposure device, and executing the exposure processing.
>
> The exposure parameter calculation processing portion performs: (1) a step of looking up illumination parameters of the optical projection system used for the exposure processing and photoresist parameters; (2) a step of looking up circuit pattern information used for the exposure processing; (3) a step of looking up aberration information of the projection lens of the exposure device; and (4) a step of calculating margins of exposure energy and focus as well as optimum values of exposure energy and focus offset for exposure processing with an optical development simulator, based on the information looked up in steps (1) to (3).
>
> By executing steps (1) to (4) in order, it becomes possible to calculate exposure energy and focus offset in consideration of the fluctuations of the process windows due to aberrations of the projection lenses of the exposure devices without performing the task of extracting the exposure parameters.

Additionally, Miwa discuses the projection lens aberration database at col. 6, lines 3 – 6, which states (emphasis added):

> The database portion 7 includes a projection lens aberration database 71 in which the projection lens aberration information (such as the Zernike coefficients) for the exposure devices is stored; . . .

Furthermore, Miwa discusses a method for measuring the aberration of a projection lens at col. 7, lines 1 – 19, which states (emphasis added):

> FIG. 6 illustrates a method for measuring the aberration of a projection lens. (1) First, an aberration measurement pattern is formed generating positional deviations causing an aberration exposed over a focusing microlens. (2) Then, a reference pattern is formed overlapping the aberration measurement pattern, such that positional deviations causing aberration are not generated. (3) Then, the shift between the reference pattern and the aberration measurement pattern depending on the height of the lens image is measured. (4) From the shift between the reference pattern and the aberration measurement pattern in the lens plane, it is possible to calculate the wavefront aberrations, and from the obtained wavefront aberrations it is possible to calculate the Zernike coefficients.
>
> In this embodiment, the Zernike coefficients are stored in the database as the aberration information of the projection lens.

As noted above, Miwa utilizes the aberration information to calculate optimum exposure energy and focus offset. That is, Miwa states at column 7, lines 40 – 55 that (emphasis added):

> In Step 106, the aberration functions of the projection lens of the exposure device used for the process are looked up in the projection lens aberration database. In Step 107, based on the data looked up in Steps 104 to 106, the range of exposure energy and focus that are still within the CD tolerance value is calculated with an exposure/development simulator . . .

Thus, Applicant submits that Miwa discloses a method of calculating exposure energy and focus offset in consideration of the fluctuations of the process windows due to aberrations of the projection lenses of the exposure devices without performing the task of extracting the

exposure parameters. However, the aberration values, which are previously calculated in accordance with conventional manners as described above, are looked up in a database. That is, for example, Miwa explicitly states at col. 10, lines 51 – 54 that (emphasis added):

> [t]he present invention calculates the exposure energy and the focus offset set for each exposure device in the exposure steps of semiconductor device fabrication, using previously obtained projection lens aberrations of the exposure devices in accordance with illumination parameters of the optical projection system, photoresist parameters, and circuit pattern information.

As such, Applicant respectfully submits that Miwa does not disclose performing simulation calculations for various levels for each aberration component using the imaging configuration characteristic data using a processor of the one or more computing devices (or means therefor) as recited in claims 1, 47 and 48. Applicant respectfully notes that Miwa is entirely silent with regard to performing simulation calculations for aberration components, let alone performing simulation calculations for various levels for each aberration component, as recited in claims 1, 47 and 48. Instead, as noted above, Miwa merely uses previously obtained projection lens aberrations of the exposure devices.

In addressing this feature of the invention, the Examiner asserts Miwa discloses performing simulation calculations for various levels for each aberration component using the image configuration characteristic data using a processor of the one or more computing devices at column 1, lines 55 – 60, stating "such as . . . optimize the illumination condition of the optical projection system of the exposure device." Applicant does not agree with this assertion. Applicant has reproduced the Examiner-cited text below, which states (emphasis added):

> With the resolution of the circuit pattern and the pattern arrangement that takes place in the exposure steps, it is possible to optimize the illumination conditions of the optical projection system of the

> exposure device, such as the numerical aperture NA and the illumination coherency σ, as well as the photoresist parameters (type, thickness, etc.).

Applicant submits that Miwa discloses that illumination conditions (e.g., numerical aperture (NA), illumination coherency, may be optimized. However, Applicant submits that aberration values are not illumination conditions. Moreover, Applicant submits that Miwa does not disclose performing simulation calculations for aberration components, let alone performing simulation calculations for various levels for each aberration component, as recited in claims 1, 47 and 48.

Thus, for at least these reasons, Applicant respectfully submits that Miwa does not disclose each of the features of claims 1, 47 and 48, and does not anticipate the present invention. Accordingly, Applicant requests the rejection of claims 1, 47 and 48 be withdrawn.

Dependent Claims 2 – 6, 9 – 13, 15, 21 – 26 and 48

Claims 2 – 6, 9 – 13, 15, 21 – 26 and 48 are dependent claims, depending from respective distinguishable base claims. Accordingly, Applicant requests the rejection of claims 2 – 6, 9 – 13, 15, 21 – 26 and 48 be withdrawn.

35 U.S.C. § 103 Rejections

Claims 7, 8, 14, 28 and 29 were rejected under 35 U.S.C. §103(a) as being unpatentable over Miwa in view of US Patent No. 6,493,063 issued to Seltmann et al. ("Seltmann"). Claims 42 – 45 were rejected under 35 U.S.C. §103(a) as being unpatentable over Miwa in view of US Patent No. 5,528,118 issued to Lee et al. ("Lee"). These rejections are respectfully traversed.

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness. See MPEP §2142. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.[2] Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). Applicant submits that the combination of references do not teach or suggest each of the features of the present invention.

Dependent Claims 7, 8, 14, 28 and 29 over Miwa in view of Seltmann

Claims 7, 8, 14, 28 and 29 are dependent claims, depending from a distinguishable base claim. Additionally, Applicant submits that Seltmann does not cure the above-noted deficiencies of Miwa. For example, Applicant submits that Seltmann is entirely silent with regard to the terms "aberrated" or "aberration." Moreover, Applicant notes that the Examiner cited Seltmann

[2] While the *KSR* court rejected a rigid application of the teaching, suggestion, or motivation ("TSM") test in an obviousness inquiry, the [Supreme] Court acknowledged the importance of identifying "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" in an obviousness determination. *Takeda Chemical Industries, Ltd. v. Alphapharm Pty., Ltd.*, 492 F.3d 1350, 1356-1357 (Fed. Cir. 2007) (quoting *KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1731 (2007)).

for its purported teachings of the features of claims 7, 8, 14, 28 and 29. Thus, these claims should also be in condition for allowance based upon their dependencies.

Accordingly, Applicant respectfully requests the rejection of claims 7, 8, 14, 28 and 29 be withdrawn.

Independent Claim 42 over Miwa in view of Lee

Claim 42 recites, in pertinent part:

> . . . means for performing simulation calculations for various levels for each aberration component using the image configuration characteristic data;
>
> means for building response surface functional relations between variables of lens characteristics associated with the image configuration characteristic data using the simulation calculations; and
>
> means for evaluating specified aberration values of a lens in relation to the response surface functional relations to provide image profile estimates for the specified aberration values.

For the reasons set forth above, with regard to independent claims 1, 47 and 48, Applicant respectfully submits that Miwa at least does not teach or suggest means for performing simulation calculations for various levels for each aberration component using the image configuration characteristic data, as recited in claim 42. Moreover, Applicant submits that Lee does not cure the above-noted deficiencies of Miwa. For example, Applicant submits that Lee is entirely silent with regard to the terms "aberrated" or "aberration." Moreover, Applicant notes that the Examiner cited Lee for its purported teachings of the linear motor features of claim 42. Therefore, Applicant submits that Miwa in view of Lee does not teach or suggest each of the features of the present invention, and does not render claim 42 unpatentable. Accordingly, Applicant respectfully requests the rejection of claim 42 be withdrawn.

Dependent Claims 43 – 45 over Miwa in view of Lee

Claims 43 – 45 are dependent claims, depending from a distinguishable base claim. Accordingly, Applicant requests the rejection of claims 43 – 45 be withdrawn.

CONCLUSION

In view of the foregoing remarks, Applicant submits that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicant hereby makes a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Deposit Account No. 19-0089.

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